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Metrication: An Economic Wake-Up Call for U.S. Industry

ABSTRACT

As the international standard of measurement, the metric system is one key to success in the global marketplace. International standards have become an important factor in international economic competition. Non-metric products are becoming increasingly unacceptable in world markets that favor metric products. Procurement is the primary federal tool for encouraging and helping U.S. industry to convert voluntarily to the metric system. Besides the perceived unwillingness of the customer, certain regulatory language, and certain legal definitions in some states, there are no major impediments to conversion of the remaining non-metric industries to metric usage. Instead, there are good reasons for changing, including an opportunity to rethink many industry standards and to take advantage of size standardization. Also, when the remaining industries adopt the metric system, they will come into conformance with federal agencies engaged in similar activities.

KEYWORDS

International standards; measurement standards; metric; metric conversion; metric system; metric transition; metrication; SI; standards

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Few of us would include conversion to the metric system among the major problems facing our Nation. We think of job creation, homelessness, health care, education, and the budget deficit as major problems. Compared to these, metric conversion seems like a minuscule problem.

However, the use of the metric system, particularly in industry and commerce, is not a problem at all, but is part of a solution. By adopting the metric system, which is the international standard of measurement, we can improve our competitiveness and our ability to sell our products in world markets. This will increase our exports and improve our balance of trade, which ultimately will lead to a higher standard of living. A high standard of living gives us the resources to help solve some of our major problems. Therefore, when viewed from the solution side of the equation, the metric system can be seen as one key to success in the global marketplace, where non-metric products are becoming increasingly unacceptable. It is also a step toward solving our major social and economic problems.

The "modernized" metric system is known as the International System of Units or SI (from the French "Le Systeme International d'Unites," which is abbreviated SI). For purposes of international trade, the metric system is more than just SI. It includes the product standards and preferred sizes that are accepted by industries and governments throughout the world.

A federal metric transition is underway

Congress understood the need for adoption of the metric system in trade and commerce and expressed the rationale in 1988 amendments to the Metric Conversion Act of 1975. The amendments require federal agencies to use the metric system in measurement-sensitive programs and functions relating to trade, industry, and commerce. This specifically includes procurements, grants, and other business-related activities. In addition to using the metric system, federal

agencies are required to seek out ways to increase understanding of the metric system through educational information and guidance.

A 1991 Presidential Executive Order directs federal agencies to develop metric transition plans, to cooperate on mutual transition issues, and to submit progress reports. An annual report from the Secretary of Commerce to the President must include an assessment of progress toward achieving "the national goal of establishing the metric system as the preferred system of weights and measures for United States trade and commerce."

Exceptions to metric usage avoid unintended harm to U.S. firms

The Metric Conversion Act allows exceptions that are designed to avoid giving advantages to foreign firms. According to the Act, exceptions are permitted where using the metric system is "impractical or is likely to cause significant inefficiencies or loss of markets to U.S. firms." Therefore, a federal agency can waive the metric requirements, on a case by case basis, if the requirement would harm U. S. businesses. Harm could result, for example, if metric usage were demanded when international standards in an industry are non-metric, or if a U.S. industry is non-metric and cannot readily meet metric specifications. Insisting on metric usage in such cases could give unintended competitive advantages to foreign firms, a result that should be avoided.

Most agencies are using the exceptions to accommodate their different judgments of their ability to overcome impediments to implementing metric usage, not as a convenient excuse for inaction. Whether the issue is converting internal operating procedures or converting contracts, grants, publications, regulations, and technical data, the agencies have different views on the amount of control, leadership, and pro-activity that they can or should exercise. As a result, the procedures for metric usage implementation are being realistically, if somewhat cautiously, integrated into operational plans for new systems and programs. The uncertainty is not whether to move to the metric system, it is how and when to make the move.

The completion of federal metric conversion will take time

Procurement is the primary federal tool for encouraging and helping U.S. industry to convert to the metric system. The direct financial benefits from selling to the government are expected to have a positive influence on industry. However, several concerns have arisen and are being addressed in interagency committees. A major concern is reconciliation of a general preference for metric products with other policies and procedures relating to federal procurement, such as full and open competition, the Buy American Act, preferences for commercial products, energy conservation, and environmental soundness. Also, there is no consensus yet on the appropriate degree of proactivity to encourage voluntary usage of the metric system by industry. In some instances, agencies that buy from suppliers who are not already converted, are reluctant to use metric units or request metric products to avoid violating the intent of the Metric Conversion Act. Suppliers logically offer either what they perceive as desired by their federal customers or what they can easily produce. This leads to a closed-loop syndrome that inhibits agency leadership and prevents industry from taking advantage of federal agency willingness to use purchasing power to help industry make the transition.

In addition, some agencies will not make significant use of the metric system until new projects become a large part of their total activity. Existing projects and facilities are not going to be changed, only new ones will be planned and implemented to metric specifications. Therefore, budget restraints that reduce new project initiatives, as well as safety considerations, transition costs, and external factors, will affect the pace of change. For example, until a large fraction of existing buildings and facilities are replaced or renovated extensively, almost all government facilities and major equipment that is currently non-metric will remain non-metric.

A growing number of agencies are cooperating to address common issues and to deal with shared problems. This is especially apparent among agencies whose activities focus on procurement, regulation, and small-business activities.

The Metrication Operating Committee (MOC) is composed of metric coordinators from the federal agencies. The subcommittees of the MOC address specific topics of interest to different agencies. These areas include construction, education, procurement, grants, standards, and federal employee training. Many agencies participate in the activities of the subcommittees and benefit from the combined efforts.

The Construction Subcommittee is one of the most active and successful groups. It has attracted participants from private industry and has published a metric-usage guide for commercial construction. The subcommittee's work was funded by participating federal agencies. Recently, the National Institute of Building Sciences, which served as secretariat for the subcommittee, created a Construction Metrication Council to build on the work of the subcommittee and to enable greater participation by private industry. MOC agencies have accepted the Construction Subcommittee's goal to design all new federal facilities in metric units by January 1994.

Another example of the growing cooperation among federal agencies to meet the mandate to use the metric system is the leadership of the Government Printing Office (GPO) and the Internal Revenue Service (IRS) in exploring a change to standard metric-sized paper, printed forms, and documents. An ad hoc committee led by the two agencies considered the advantages and disadvantages of adopting standard metric paper and binding sizes, compared to continuing use of the current sizes described in metric units. They surveyed industry and the federal agencies and are examining transition costs and long-term benefits, document handling, storage, reproduction, information management, and other related activities. Some agencies are already using standard size metric paper to a limited degree for correspondence and reports.

In both examples, an important outcome will be that U.S. manufacturers (of construction and building products and of paper and publishing products) will be in a better position to export their products.

Metric usage is still industry's choice

Although federal agency use of the metric system is mandatory, metric use is voluntary for industry. So even while the benefits will be gained by industry, conversion is still industry's choice and the federal government is not forcing universal use of metric units or the changing of products to meet metric standards.

When the Metric Conversion Act was first passed in 1975, the entire metric transition process it initiated was completely voluntary and broadly based. With some exceptions, the process was not embraced by industry or government. For many industry sectors, there was no apparent urgent economic necessity for it. In non-business sectors of society, the process not only failed to be embraced, but instead raised anxiety and was actively resisted.

Since 1975, some industries that produce and market products and that buy and sell components worldwide shifted to metric specifications for their products. The shift eliminated redundant products in different measurement systems, improved interchangeability, and streamlined the use of resources in a distributed environment. In some cases the shift was accompanied by other economies. For example, the automobile and the soft-drink, wine, and liquor industries took the opportunity to examine and reevaluate other business practices at the same time that they were planning the change to metric sizes. They benefited in standardizing on fewer sizes for their products, and for them the metric transition was truly an "economic wake-up call."

But even for industries where international commerce is not a factor, and for firms that do not export, a metric transition can be an economic benefit. For example, for packaged perishable products such as canned foods, the packagers and distributors may not see any economic opportunities in shifting to metric sizes, especially if the market is solely domestic. But what about the firms that make the packages and containers, and the materials for the containers, or the

firms that make the machines for making and handling the containers?

The containers, as well as the manufacturing and handling equipment, could be sold worldwide if they met metric standards. Therefore, although a particular industry may not be able to export and may not want to change their practices, their partners in other industries may be missing an opportunity. Sometimes an industry's suppliers in different industries could benefit by shifting to metric products, even if the industry they supply may not gain an immediately benefit.

Because individual firms make decisions for their perceived self interest, they sometimes discount indirect and long-term benefits that they might realize. For example, they are likely to see clearly the immediate costs of conversion and to fear the possible negative impacts on their sales because customers may reject the change. However, they tend not to see a variety of equally likely outcomes that ultimately will have a greater effect. They may not consider the larger markets their suppliers may gain which could result in lower costs for their own supplies. They may be unable to anticipate that foreign firms operating in the United States could become new customers for their products. They may be unaware of U.S. exporters that are not including their products as components in exports because the products are non-metric. And they may be missing new opportunities simply because they are shutting out the entire rest of the world from becoming their customers. Nevertheless, that is their choice.

The world economy has changed in ways that favor metric products

In 1988, the Congress perceived that for the United States as a whole it was in our self interest to change to the use of the metric system in trade and commerce. This amending of the Metric Conversion Act reflected long-term, visionary thinking. The benefits Congress saw included not only the advantages to be gained by metric usage, but also the costs that are being incurred by delaying metric usage, such as diminishing shares of world markets and a trade imbalance that is eroding our standard of living.

Until recently, most U.S. industries did not see the need for metric usage because use of non-metric units was not a barrier to business transactions either domestically or internationally. Many of our major trading partners had been using the same system of units as we were using. However since 1975, several changes in international commerce created the economic necessity to use the metric system in U.S. industry.

The first change was that all of our non-metric trading partners, including England, Canada, Australia, and China, completed conversion to use of the metric system. Today, all industrial nations of the world except the United States use the metric system almost exclusively.

The second change that made metric usage necessary in business was the emergence of the well-known "global economy" or "global marketplace." In the global economy, products move easily across national boundaries; products are international and different stages in their life cycle may occur in different countries. Products may be designed in one country, fabricated in another country, maintained and repaired in a third country, and finally disposed of in still another country. These products must be compatible with the design, fabrication, maintenance, repair, and disposal systems that are used for these life cycle processes. This is another way of saying that products must be metric-compatible. Obviously, this is easiest for metric products.

The best approach is conformance to international standards

A phenomenon in the global economy is that international standards have become an important factor in international economic competition. Because products and services in the global marketplace must be acceptable in all countries, they must comply with international standards, especially the international standard of measurement, which is the metric system.

Increasingly, international standards are being "harmonized." Harmonization involves the integration, or consolidation, of standards that may be overlapping or conflicting into an unambiguous set of standards that are consistent, compatible, and complementary. With certain exceptions, the metric system is used for measurements in all standards. This harmonization of international standards is the third change that is turning metric usage into an economic necessity.

There has been a fourth change since 1975 that makes the metric system, and international standards in general, more important. It is that power and influence in world affairs depend less and less on military strength and more and more on economic strength. In a real sense, the primary arena for global competition is the global marketplace. Therefore, by resisting the change to the metric system, we are in effect imposing a trade barrier on ourselves. This barrier is especially onerous because the world economy is growing faster than our domestic economy. Yet even more importantly, by resisting the change to the metric system we are consciously limiting our worldwide prestige and power.

Some types of standards have been viewed by industry as constrainers of innovation and inhibitors of new technologies. Fortunately, measurement standards relate to interoperability and intercommunication. Interoperability and intercommunication within and among firms maximizes industrial flexibility and productivity. Therefore, measurement standards contribute directly to increased competitiveness.

Measurement standards are welcomed by producers because they lower barriers to market entry, reduce the risk that a product's attributes will be unacceptable or incompatible for use with related products, and they enlarge the market. Consumers also welcome measurement standards because they lead to more intense competition, a larger number of products from which to choose, a greater variety of products that are both less likely to become obsolete and more likely to be easily integrated into existing systems, and, as a result, lower prices. Since everyone wins with internationally accepted measurement standards, everyone can win with the metric system.

Everyone can make a difference and can share in the benefits from converting to the metric system

In any comprehensive program, even when the overall benefits are clearly significant, certain individual details may seem costly, uncomfortable, or difficult. It is easy to select a single detail and question its value when it is removed from the context of the overall program. For example, the question can be asked, "Why do we need to change products or services that we do not export?" This question obviously applies to such things as certain perishable food products, most surveying services, highway signs, and homes. The simplest answer to the question is that we do not need to change such domestic products and services. But if the question is viewed in the broader context of the overall benefits, a different answer becomes clear: We need to change all commercial activities, as well as the educational systems that support them, to remove our dependence on an obsolete system so that we can gain the maximum benefits of moving to the metric system.

Our economy is complex and interrelated. Industries that export cannot be compartmentalized from other industries; they share the same workforce, the same domestic customers, the same financial infrastructure, and the same suppliers. As long as non-metric units are used in certain industries, we must continue to teach the cumbersome and outmoded inch-pound system in our schools, along with the metric system. Therefore the opportunity to eliminate instruction in the inch-pound system is lost. Also, the benefit of using a simpler system of units throughout society is forfeited.

Even on the individual level, each of us can have a positive influence on U.S. firms, whether they export or operate solely domestically. In reality, each of us is a participant, through being a consumer or a worker or a taxpayer, in our national economy and in the global marketplace. Our decisions and our knowledge affect our Nation's economy and, ultimately, our standard of living. Returning to the example of education, since the quality and effectiveness of our educational system ultimately determines our economic well-being,

eliminating instruction in an increasingly unnecessary system of units provides an opportunity for improving the entire mathematics curriculum. Graduating workers with the knowledge of the metric system removes the need for industry to train workers in unfamiliar (to them) metric units. And if these graduates have greater general mathematics skills, then they are more qualified for all firms, including purely domestic ones.

There are no significant technical barriers to conversion

Common sense, based upon the knowledge, experience, and needs of the industry, should be the determinant in choosing practical conversion strategies. For example, the commercial construction industry has chosen to express distances in millimeters, with 100 millimeters as the basic module dimension and 600 and 1200 millimeters frequently used for planning and design. The food packaging industry is choosing to follow the "rule of 1000." A package containing 1200 milliliters will likely be labeled 1.2 liters.

There are two general approaches to metric conversion. In "exact conversion," which is sometimes called "soft" conversion, the product is not changed in size but it is described in metric units. The metric equivalent to the inch-pound system magnitude is determined by multiplying by a conversion factor. When electronic equipment is switched to read in meters instead of feet, or software is modified to calculate in hectares instead of acres, an exact mathematical conversion has been made.

In the "size substitution" approach, the product is changed to an accepted standard metric size or a rational whole number of metric units. The choice of a standard-sized or a rational-sized metric product is often made to conform to international practices and conventions. This approach is said to produce a "hard" metric conversion.

The remaining non-metric industries can change

In the United States, besides the perceived unwillingness of the customer, certain regulatory language, and certain legal definitions in some states, there are no major impediments to conversion of the remaining non-metric industries to metric units. In contrast, there are good reasons for changing to metric units. In addition to the indirect benefits to the economy as a whole, each industry will benefit directly. Not only is the metric system easier to use, but, as has been experienced by the construction industry in engineering design, fewer errors are made when the metric system is used in place of the inch-pound system.

Most importantly, as the automobile and beverage container industries discovered, changing to metric units is an opportunity to rethink many industry standards and to take advantage of size standardization.

Although there are competing national priorities, every day the United States moves further along the path to joining the global community in metric measurement standards. The efforts of federal agencies are helping to move us more rapidly along this metrication path. The decisions of industry and professional groups to adopt the metric system for their products and services are gaining for all of us the economic benefits that await us at the end of the path.